i. at least one illumination chamber, and

ii. at least one reaction chamber,

wherein the illumination chamber and the reaction chamber are in flow communication and are spatially separated in the reaction cell.

7. (Amended) A microfluidic reactor according to claim 1, wherein the reaction cells are adapted for use of in situ generated chemical reagents which are generated in solution in the illumination chamber.

18. (Amended) A microfluidic reactor according to claim 1, wherein the reactor further comprises an inlet channel and an inlet restriction gap connected to the illumination chamber, and an outlet channel and an outlet restriction gap connected to the reaction chamber.

35. (Amended) A microfluidic reactor according to claim 34, wherein the fluid channels have a first cross sectional area, the reaction cells have a second cross sectional area which is smaller than the first cross sectional area, and the ratio between the first and second cross sectional areas is from 1:10 to 1:1000.

43. (Amended) A microfluidic reactor according to claim 1, wherein the device comprises an array of oligonucleotides in the reaction chambers, a microfluidic template made of silicon, at least one window plate, a shadow mask, inlet channels and inlet restriction gaps connected to the illumination chambers, outlet channels and outlet restriction gaps connected to the reaction chambers, distribution channels for parallel reactions in the reaction cells, and connection channels to connect illumination chambers and reaction chambers.

46. (Amended) A microfluidic reactor according to claim 43, wherein the oligonucleotides are immobilized with use of linker molecules.

47. (Amended) A microfluidic reactor according to claim 1, wherein the reaction cells, illumination chambers, and reaction chambers are adapted for use of in situ generated chemical reagents in solution.

100. (Amended) A microfluidic reactor comprising at least one microfluidic template and at least one window plate attached to the template, the microfluidic template and the window plate defining a plurality of reaction cells which provide for flow of liquid solution through the cells, each reaction cell comprising a first chamber in fluid communication with but spatially separated from a second chamber, the first chamber being adapted to be an illumination chamber, and the second chamber being adapted to be a reaction chamber.

104. (Amended) A microfluidic reactor according to claim 100, wherein the first chamber is connected to an inlet channel, the second chamber is connected to an outlet channel, and the plurality of reaction cells are connected by distribution channels.

145. (Amended) A microfluidic reactor comprising a plurality of reaction cells, each reaction cell comprising at least one illumination chamber and at least one reaction chamber, wherein the illumination chamber and the reaction chamber are in fluid communication and are spatially separated in the reaction cell, wherein the plurality of reaction cells are in fluid communication with at least one inlet channel and at least one outlet channel, wherein the reaction cells are connected in parallel with fluid distribution channels, wherein each reaction cell has a separate outlet channel which allows for individual collection of effluent from each reaction cell.

150. (Amended) A microfluidic reactor adapted for in situ use of photogenerated reagents in solution, wherein the reactor comprises an inlet channel, an illumination chamber, a connection channel, a reaction chamber, and an outlet channel, wherein the illumination chamber connects with the inlet channel, the connection channel connects the illumination chamber and the reaction chamber, and the outlet channel connects with the reaction chamber.

159. (Amended) A method for enhancing parallel photochemical reactivity in a microfluidic reactor having a plurality of isolated reaction cells, said method comprising the step of providing spatially separated illumination and reaction chambers in each reaction cell.

Additionally, please add the following claims:

160. The microfluidic reactor according to claim 1, wherein predetermined illumination chambers are illuminated by digital-micromirror-device-based light projection.

161. A chip according to claim 48, wherein the chip has a configuration with one or more levels.

162. A microfluidic reactor comprising:

a plurality of flow-through reaction cells, each reaction cell comprising:

i. at least one illumination chamber, and

ii. at least one reaction chamber,

wherein the illumination chamber and the reaction chamber are in flow communication and are spatially separated in the reaction cell;

wherein digital-micromirror-device-based light projection illuminates predetermined illumination chambers.